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AN EDDY PREMITTING GLOBAL OCEAN AND SEA-ICE MODEL ON A QUASI-UNIFORM EXPANDED CUBE GRID SUITABLE FOR DECADAL TIME-SCALE DATA ASSIMILATION.

C. Hill (1), D. Menemenlis (2), A. Adcroft (1), A. Eichmann (1), J-M Campin (1)

(1) Massachusetts Institute of Technology - cnh@mit.edu, (2) NASA, Jet Propulsion Laboratory, Pasadena, CA

We describe preliminary results from an eddy permitting ocean and sea-ice configuration of the M.I.T General Circulation Model (MITgcm) that is designed to support dynamically reasonable estimates of the full three-dimensional, time-varying oceanic state on decadal time-scales. Undertaken as part of the Estimating the Circulation and Climate of the Ocean (ECCO) project the model configuration we will present is suited to constraints by both remotely-sensed (altimeter, scatterometer, ocean temperature, ice cover, and gravity) data and by in-situ (temperature and salinity profilers, mooring, drifter, and float) data using advanced assimilation methods (adjoint method, Kalman filter and Rauch-Tung-Striebel smoother).

Over the past four years the ECCO project has demonstrated the feasibility and utility of providing global, sustained, dynamically reasonable estimates of the full three-dimensional, time-varying oceanic state. These estimates are made available in near-realtime and are being used for a wide variety of scientific and operational purposes. To date however, computational demands have limited the existing ECCO products to rather coarse resolution (30 to 100-km grids). With this limited resolution it is not possible to adequately represent many small-scale features of the oceanic circulation (western boundary currents, meso-scale eddies, convection,

etc.).

Our model configuration employs a novel gridding approach that avoids singularities anywhere on the sphere by projecting grid-lines from an embedded cube onto the sphere surface. Using this approach we obtain a truly global grid with no singularities anywhere on the sphere. The grid has maximal grid spacing of 25.9 km and minimal grid spacing of 4.2 km. The global coverage of the grid allows us to include an interactive representation of the polar oceans and of sea-ice into our assimilation system. The grid spacing is sufficient to allow a rich mesoscale eddy field to emerge. Using state-of-the-art large-scale parallel computer resources, committed to the project by NASA, the system simulates several years in a day. This throughput is sufficient to allow a practical, semi-continuous assimilation system that partially resolves the ocean eddy field to be envisaged. In this presentation we will describe steps taken so far to achieve an optimal model configuration for this work.